AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. (currently amended) A method for quantifying cardiac desynchrony of the right and left ventricles, the method comprising:

obtaining cardiac acquisition data from a medical imaging system;

determining a movement profile from said cardiac acquisition data, said movement profile directed toward identifying at least one of: a time-based contraction parameter for a region of the left ventricle (LV), and a displacement-based contraction parameter for a region of the LV; ~~and~~

visually displaying said determined movement profile by generating a 3D model therefrom;

based on said movement profile and said 3D model, identifying a site and a route for biventricular lead placement on the LV;

determining LV anatomical landmarks of interest and inserting geometric markers into said 3D model thereat; and

registering said 3D model having said geometric markers with an interventional medical system for real-time 3D visualization of the LV and interventional lead placement thereat.

2. (original) The method of claim 1, wherein said displacement-based contraction parameter further comprises a displacement profile for each of a plurality of designated regions.

3. (original) The method of claim 2, wherein said displacement profile for each of a plurality of designated regions is used to identify one of said plurality of designated regions having a maximum displacement with respect to a starting position thereof at a given cardiac cycle point.

4. (original) The method of claim 1, wherein said time-based contraction parameter further comprises last to contract information based upon displacement versus time information over a cardiac cycle, for each of a plurality of designated regions.

5. (original) The method of claim 4, wherein a last to contract region from said plurality of designated regions is identified by determining which of said plurality of designated regions is last to attain a maximum displacement thereof.

6. (original) The method of claim 1, wherein said time-based contraction parameter further comprises last to contract information based upon a velocity profile for each of a plurality of designated regions.

7. (original) The method of claim 6, wherein said velocity profile further comprises velocity versus time information over a cardiac cycle, for each of said plurality of designated regions.

8. (original) The method of claim 7, wherein said last to contract information from said plurality of designated regions is identified by determining which of said plurality of designated regions is last to attain a maximum velocity thereof.

9. (original) The method of claim 1, wherein said determining a movement profile further comprises determining a contraction profile for the right ventricle (RV).

10. (currently amended) A method for planning biventricular pacing lead placement for a patient, the method comprising:

obtaining cardiac acquisition data from a medical imaging system;

determining a movement profile from said cardiac acquisition data, said movement profile directed toward identifying at least one of: a time-based contraction parameter for a region of the left ventricle (LV), and a displacement-based contraction parameter for a region of the LV;

visually displaying said determined movement profile by generating a 3D model therefrom;

visualizing one or more coronary vessels on said generated 3D model;~~ and~~

identifying at least one suitable region on the left ventricle wall for epicardial lead placement based on said determined movement profile and said visualized coronary vessels;

determining LV anatomical landmarks of interest and inserting geometric markers into said 3D model thereat; and

registering said 3D model having said geometric markers with an interventional medical system for real-time 3D visualization of the LV and interventional lead placement thereat.

11. (original) The method of claim 10, further comprising identifying the presence of any necrosed tissue and visualizing any of said necrosed tissue on said 3D model, wherein the identification of any sites of such necrosed tissue is used to eliminate said sites from epicardial lead placement.

12. (original) The method of claim 10, wherein said identifying at least one suitable region further includes identifying the blood vessels on the epicardium of the left

ventricle and eliminating at least one of the blood vessels and the myocardium directly under the blood vessels as a suitable region.

13. (original) The method of claim 10, wherein said displacement-based contraction parameter further comprises a displacement profile for each of a plurality of designated regions.

14. (original) The method of claim 13, wherein said displacement profile for each of a plurality of designated regions is used to identify one of said plurality of designated regions having a maximum displacement with respect to a starting position thereof at a given cardiac cycle point.

15. (original) The method of claim 10, wherein said time-based contraction parameter further comprises last to contract information based upon displacement versus time information over a cardiac cycle, for each of a plurality of designated regions.

16. (original) The method of claim 15, wherein a last to contract region from said plurality of designated regions is identified by determining which of said plurality of designated regions is last to attain a maximum displacement thereof.

17. (original) The method of claim 10, wherein said time-based contraction parameter further comprises last to contract information based upon a velocity profile for each of a plurality of designated regions.

18. (original) The method of claim 17, wherein said velocity profile further comprises velocity versus time information over a cardiac cycle, for each of said plurality of designated regions.

19. (original) The method of claim 18, wherein said last to contract information from said plurality of designated regions is identified by determining which of said plurality of designated regions is last to attain a maximum velocity thereof.

20. (original) The method of claim 10, wherein said identifying at least one suitable region further comprises quantifying selected dimensions of said blood vessels on the epicardium of the left ventricle.

21. (original) The method of claim 10, wherein said determining a movement profile further comprises determining a contraction profile for the right ventricle (RV).

22. (currently amended) A method for planning biventricular pacing lead placement for a patient, the method comprising:

obtaining cardiac acquisition data from a medical imaging system;

determining a movement profile from said cardiac acquisition data, said movement profile directed toward identifying at least one of: a time-based contraction parameter for a region of the left ventricle (LV), and a displacement-based contraction parameter for a region of the LV;

visually displaying said determined movement profile by generating a 3D model therefrom;

visualizing one or more coronary vessels on said generated 3D model;

identifying at least one suitable region on the left ventricle wall for epicardial lead placement based on said determined movement profile and said visualized coronary vessels;

identifying coronary sinus branches closest to said at least one suitable region and displaying said identified coronary sinus branches on said 3D model;

identifying one or more left ventricle anatomical landmarks on said 3D model and inserting geometric markers into said 3D model thereat;

registering saved views of said 3D model having said inserted geometric markers on an interventional system;

visualizing one or more of said registered saved views with said interventional system; and

identifying a minimally invasive route for epicardial lead placement at said at least one suitable region on the left ventricle wall based on said determined movement profile and said 3D model.

23. (original) The method of claim 22, further comprising identifying the presence of any necrosed tissue and visualizing any of said necrosed tissue on said 3D model, wherein the identification of any sites of such necrosed tissue is used to eliminate said sites from epicardial lead placement.

24. (original) The method of claim 22, wherein said identifying at least one suitable region further includes identifying the blood vessels on the epicardium of the left ventricle and eliminating at least one of the blood vessels and the myocardium directly under the blood vessels as a suitable region.

25. (original) The method of claim 22, wherein said displacement-based contraction parameter further comprises a displacement profile for each of a plurality of designated regions.

26. (original) The method of claim 25, wherein said displacement profile for each of a plurality of designated regions is used to identify one of said plurality of designated regions having a maximum displacement with respect to a starting position thereof at a given cardiac cycle point.

27. (original) The method of claim 22, wherein said time-based contraction parameter further comprises last to contract information based upon displacement versus time information over a cardiac cycle, for each of a plurality of designated regions.

28. (original) The method of claim 27, wherein a last to contract region from said plurality of designated regions is identified by determining which of said plurality of designated regions is last to attain a maximum displacement thereof.

29. (original) The method of claim 22, wherein said time-based contraction parameter further comprises last to contract information based upon a velocity profile for each of a plurality of designated regions.

30. (original) The method of claim 29, wherein said velocity profile further comprises velocity versus time information over a cardiac cycle, for each of said plurality of designated regions.

31. (original) The method of claim 30, wherein said last to contract information from said plurality of designated regions is identified by determining which of said plurality of designated regions is last to attain a maximum velocity thereof.

32. (original) The method of claim 22, further comprising utilizing post processing software to process said acquisition data so as to generate short axis images of the LV and thoracic wall.

33. (original) The method of claim 32, wherein said 3D model and said short axis images are visualized through a display screen associated with said interventional system.

34. (original) The method of claim 22, wherein said obtaining acquisition data is EKG gated.

35. (original) The method of claim 22, further comprising segmenting said acquisition data using a 3D protocol and short axis protocols so as to visualize the thoracic wall, LV walls and epicardial fat.

36. (original) The method of claim 22, wherein said medical imaging system is one of a computed tomography system, a magnetic resonance imaging system, an ultrasound system, and a 3D fluoroscopy system.

37. (original) The method of claim 22, wherein said identifying at least one suitable region further comprises quantifying selected dimensions of said blood vessels on the epicardium of the left ventricle.

38. (original) The method of claim 22, wherein said determining a movement profile further comprises determining a contraction profile for the right ventricle (RV).

39. (original) The method of claim 22, further comprising generating, from said saved view of said 3D model, reports for diagnosis and interventional planning.

40. (currently amended) A system for quantifying cardiac desynchrony of the right and left ventricles, comprising:

a medical imaging system for obtaining cardiac acquisition data;

an image generation subsystem for receiving said acquisition data and determining a movement profile from said cardiac acquisition data, said movement profile directed toward identifying at least one of: a time-based contraction parameter for a region of the left ventricle (LV), and a displacement-based contraction parameter for a region of the LV; and

an operator console for visually displaying said determined movement profile by generating a 3D model therefrom;

wherein said operator console facilitates: identifying a site and a route for biventricular lead placement on the LV; determining LV anatomical landmarks of interest and inserting geometric markers into said 3D model thereat; and, registering said 3D model having said geometric markers with an interventional medical system for real-time 3D visualization of the LV and interventional lead placement thereat.

41. (original) The system of claim 40, wherein said displacement-based contraction parameter further comprises a displacement profile for each of a plurality of designated regions.

42. (original) The system of claim 41, wherein said displacement profile for each of a plurality of designated regions is used to identify one of said plurality of designated regions having a maximum displacement with respect to a starting position thereof at a given cardiac cycle point.

43. (original) The system of claim 40, wherein said time-based contraction parameter further comprises last to contract information based upon displacement versus time information over a cardiac cycle, for each of a plurality of designated regions.

44. (original) The system of claim 43, wherein a last to contract region from said plurality of designated regions is identified by determining which of said plurality of designated regions is last to attain a maximum displacement thereof.

45. (original) The system of claim 40, wherein said time-based contraction parameter further comprises last to contract information based upon a velocity profile for each of a plurality of designated regions.

46. (original) The system of claim 45, wherein said velocity profile further comprises velocity versus time information over a cardiac cycle, for each of said plurality of designated regions.

47. (original) The system of claim 46, wherein said last to contract information from said plurality of designated regions is identified by determining which of said plurality of designated regions is last to attain a maximum velocity thereof.

48. (original) The system of claim 40, wherein said a movement profile further comprises a contraction profile for the right ventricle (RV).

49. (original) A system for planning biventricular pacing lead placement for a patient, comprising:

a computed tomography medical imaging system for generating acquisition data;

an image generation subsystem for receiving said acquisition data and determining a movement profile from said cardiac acquisition data, said movement profile directed toward identifying at least one of: a time-based contraction parameter for a region of the left ventricle (LV), and a displacement-based contraction parameter for a region of the LV;

an operator console for visually displaying said determined movement profile by generating a 3D model therefrom, said operator console further configured for visualizing one or more coronary vessels on said generated 3D model; and

a workstation including post processing software for registering saved views of said 3D model on an interventional system;

wherein said interventional system is configured for visualizing one or more of said registered saved views therewith and for identifying a minimally invasive route for epicardial lead placement at said at least one suitable region on the left ventricle wall.

50. (original) The system of claim 49, wherein said workstation is configured for identifying the presence of any necrosed tissue, and said operator console is configured for visualizing any of said necrosed tissue on said 3D model, wherein the identification of any sites of such necrosed tissue is used to eliminate said sites from epicardial lead placement.

51. (original) The system of claim 50, wherein said post processing software is further configured to process said acquisition data so as to generate short axis images of the LV and thoracic wall.

52. (original) The system of claim 51, further comprising a display screen associated with said interventional system, said display screen for visualizing said 3D model and said short axis images.

53. (original) The system of claim 49, wherein said image generating subsystem is EKG gated.

54. (original) The system of claim 49, wherein said displacement-based contraction parameter further comprises a displacement profile for each of a plurality of designated regions.

55. (original) The system of claim 54, wherein said displacement profile for each of a plurality of designated regions is used to identify one of said plurality of designated regions having a maximum displacement with respect to a starting position thereof at a given cardiac cycle point.

56. (original) The system of claim 49, wherein said time-based contraction parameter further comprises last to contract information based upon displacement versus time information over a cardiac cycle, for each of a plurality of designated regions.

57. (original) The system of claim 56, wherein a last to contract region from said plurality of designated regions is identified by determining which of said plurality of designated regions is last to attain a maximum displacement thereof.

58. (original) The system of claim 49, wherein said time-based contraction parameter further comprises last to contract information based upon a velocity profile for each of a plurality of designated regions.

59. (original) The system of claim 58, wherein said velocity profile further comprises velocity versus time information over a cardiac cycle, for each of said plurality of designated regions.

60. (original) The system of claim 59, wherein said last to contract information from said plurality of designated regions is identified by determining which of said plurality of designated regions is last to attain a maximum velocity thereof.

61. (original) The system of claim 49, wherein said medical imaging system is one of a computed tomography system, a magnetic resonance imaging system, an ultrasound system, and a 3D fluoroscopy system.

62. (original) The system of claim 49, wherein operator console is further configured for quantifying selected dimensions of said blood vessels on the epicardium of the left ventricle.

63. (original) The system of claim 49, wherein said movement profile further comprises a contraction profile for the right ventricle (RV).

64. (original) The system of claim 49, wherein said workstation is further configured for generating, from said saved view of said 3D model, reports for diagnosis and interventional planning.

65. (new) The method of claim 22, further comprising:

inserting geometric markers at the one or more anatomical landmarks such that the visualizing comprises visualizing the LV in a translucent fashion with opaque geometric markers.

66. (new) The system of claim 49, wherein:

the workstation is configured for inserting geometric markers at one or more left ventricle anatomical landmarks corresponding to the 3D model.

67. (new) The system of Claim 66, wherein:

the workstation is configured to display the left ventricle in a translucent fashion and the geometric markers in an opaque fashion.

68. (new) The method of Claim 1, wherein:

the cardiac acquisition data is obtained from a computed tomography medical imaging system.